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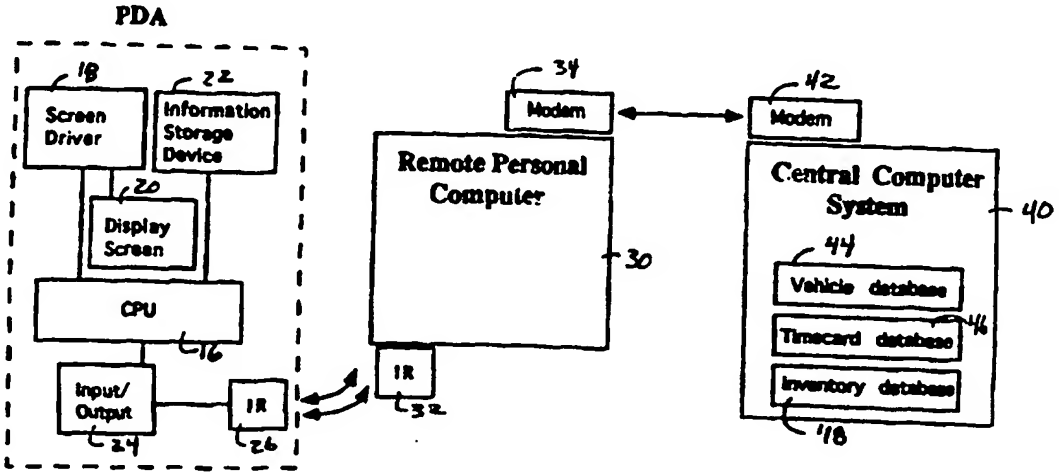

(57) Abstract

The present invention provides a system and method for coordinating maintenance, or other activities, for a plurality of motor vehicles, or other objects of a type subject to repeated need for the activities. The system utilizes an intelligent, hand-held, portable data entry and data processing device to display a schedule of activities for a plurality of objects as a menu of choices for selection, to store a record of activity for a selection, and to transmit the record of activity to update a database for the objects.

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"METHOD AND SYSTEM FOR COORDINATING MAINTENANCE ACTIVITIES FOR A PLURALITY OF MOTOR VEHICLES"

Technical Field

The present invention relates generally to coordinating activities to be performed in connection with a plurality of objects, and more particularly to an improved system for, and method of, scheduling maintenance activities for a plurality of motor vehicles.

Background of the Invention

Transportation companies, such as United Parcel Service, comprise shipping networks that span vast geographic distances. To efficiently service such networks, transportation companies employ large fleets of motor vehicles dispersed at regional offices, or hubs, that operate with one another to ship parcels between various locations.

In continually transporting parcels, fleet vehicles receive heavy use. Accordingly, they require regular inspection and repair services to reduce breakdowns and increase vehicle life expectancy. Additionally, because vehicles do break down despite regular maintenance, fleet vehicles require unscheduled repair services to minimize time lost by such breakdowns.

The task of scheduling maintenance activities for fleets that comprise hundreds of vehicles is complex, typically requiring an entire department devoted to that purpose. Such vehicle departments typically operate from a central location and generate maintenance schedules for the regional offices. In addition to generating maintenance schedules, vehicle departments typically track vehicle histories, parts inventory, and mechanic

payroll information. With that information, vehicle departments also set standard labor times for completing various types of inspections and repairs, and provide statistical analysis for improving maintenance operations.

Traditionally, scheduled maintenance activities are printed onto sheets of paper and distributed to mechanics. Mechanics perform assigned maintenance activities and record pertinent information concerning an activity on its corresponding sheet of paper. Such pertinent information includes the parts used, the time spent, and additional maintenance performed on the vehicle. That information may then be keyed into a computerized vehicle information system for use by the vehicle department.

A problem with the traditional method is that it generates a large amount of paper work that clutters the shop floor. Another problem with the traditional method is that the information recorded by mechanics must be manually keyed into the information system, which is time consuming and costly.

More recently, scheduled maintenance activities have been bar coded with mechanics entering their activities into portable terminals by scanning bar codes from thick books on the shop floor. Using bar codes, mechanics also enter information concerning parts used during their maintenance activities. This method eliminates the need to key enter collected information because bar coded information can be directly uploaded to an information system.

The use of bar codes, however, increases paper on the shop floor because of the large books of bar codes required. Furthermore, this method is costly because of the number of bar code books that must constantly be updated on each shop floor. This method is also time consuming, requiring mechanics to search through many pages to find the correct activity and parts codes.

Therefore, a need exists in the art for a system for, and method of, efficiently coordinating maintenance activities for a fleet of motor vehicles. The method and system should minimize paper use, be intuitive to mechanics, and allow them to contemporaneously record time spent performing an activity.

Summary of the Invention

The present invention seeks to provide a system for, and method of, coordinating activities for a plurality of objects, such as motor vehicles, of a type subject to repeated need for the activities, which displays a schedule of activities to be performed with respect to a plurality of objects as a menu of choices for selection, compiles a record of activities performed, and shares the recorded information with a remote computer.

In accordance with the invention, these objects are accomplished by providing a method and system for coordinating maintenance, or other activities, for a plurality of motor vehicles, or other objects of a type subject to repeated need for the activities. The system utilizes an intelligent, hand-held, portable data entry and data processing device to display a schedule of activities for a plurality of objects as a menu of choices for selection, to store a record of activity for a selection, and to transmit the record of activity to update a database for the objects.

Generally described, the present invention provides an intelligent, hand-held, portable device for coordinating activities of an organization. The intelligent, hand-held, portable device includes a processor connected to an input device for receiving information, a data transfer device for receiving and transmitting information, an information storage device, and a screen device for displaying information. The processor is configured to store a schedule of activities to be performed with respect to a plurality of objects and to display the schedule on the screen device as a menu of choices for selection.

The processor further stores a record of activity for a selection, and transmits the record of activity for updating a database for the objects. Preferably, the record of activity also includes time spent performing the activities, for updating a timecard database, and an accounting of inventory items used during the activities, for updating an inventory database.

In a preferred embodiment, the data transfer device is selectively operable to receive the schedule from a remote personal computer located at a regional office of an organization and to transmit activity records to the remote personal computer. The remote personal computer is equipped with a modem to receive the schedule from a central computer system and to

transmit activity records to the central computer system, which contains the object, timecard, and inventory databases.

In the preferred embodiment, the input device is a touch sensitive device associated with the screen to allow a selection to be made from the menu display by contact with the screen. The intelligent, hand-held, portable device may include a stylus to act in cooperation with the touch sensitive device for entering a selection from the menu.

In the context of fleet vehicle maintenance, the present invention might typically be used as follows. A weekly maintenance schedule for each mechanic of an organization is determined by a central vehicle department and downloaded from a central computer system to the regional offices of the mechanics. The maintenance schedule is received by a remote personal computer at the regional office and downloaded to the intelligent, hand-held, portable devices of the mechanics, preferably a personal digital assistant (PDA) computer.

To perform scheduled maintenance, a mechanic logs onto his or her PDA and enters a selection from a menu of scheduled maintenance activities. As the mechanic performs the selected maintenance activity, he or she enters the work performed and the parts used into the PDA. Contemporaneously therewith, the PDA tracks the time being spent for the selected activity. Upon completion of the selected activity, the mechanic enters the status of the selected activity and a record of activity is stored in the PDA. The record of activity includes the time spent, the maintenance activities performed and the parts used therein.

At the end of the mechanic's shift, the records of activity are uploaded to the remote personal computer of the regional office. The records of activity are transmitted from the remote personal computer to the central computer system, in which a vehicle database, a timecard database, and an inventory database are maintained.

Brief Description of the Drawings

Fig. 1 is a block diagram of a system for coordinating activities of an organization in accordance with the preferred embodiment of the present invention.

Fig. 2 is a diagrammatic view showing the information transmitted between the components of the system of Fig. 1 in accordance with the preferred embodiment of the present invention.

Fig. 3 is a logical flow diagram showing the sequence of steps for configuring a PDA and for transmitting information to and from the PDA in accordance with the preferred embodiment of the present invention.

Figs. 4A-4J are a sequence of screen displays from the user's perspective showing the process of configuring the PDA and of transmitting recorded information with the same in accordance with the preferred embodiment of the present invention.

Fig. 5 is a logical flow diagram showing the sequence of steps for performing scheduled maintenance with the PDA of the present invention in accordance with the preferred embodiment.

Figs. 6A-6J are a sequence of screen displays from the user's perspective showing the process of performing scheduled maintenance with the PDA of the present invention in accordance with the preferred embodiment.

Fig. 7 is a logical flow diagram showing the sequence of steps for performing unscheduled maintenance with the PDA of the present invention in accordance with the preferred embodiment.

Figs. 8A-8D are a sequence of screen displays from the user's perspective showing the process of performing unscheduled maintenance with the PDA of the present invention in accordance with the preferred embodiment.

Detailed Description

Referring to the drawings, in which like numerals refer to like parts throughout the several views, Fig. 1 shows the components of a system 12 for coordinating activities for a plurality of objects of a type subject to repeated need for the activities. It the preferred embodiment, the system 12 coordinates maintenance activities for a plurality of motor vehicles of an organization. It will be understood by those skilled in the art, however, that the system 12 can be used to coordinate maintenance activities for objects of many different types, and that it can be used to coordinate other types of activities.

The system 12 includes an intelligent, hand-held, portable device 14, of the type known as a personal digital assistant (PDA). The PDA 14 includes a processor or CPU 16 that is typically implemented as a microprocessor. The processor 16 is operative to control various devices within the PDA 14 to retrieve, process, store, and display data. A preferred PDA 14 for use in connection with the present invention is model Z-7000 manufactured by Casio.

An input device is associated with a display device to form a touch-sensitive data entry and display screen 20. The display screen 20 is connected to the processor 16 via a screen driver circuit 18, which operates the input and display functions of the display screen 20. The display screen 20 is capable of interpreting handwriting and of defining button or key areas. For example, the screen may display a typewriter keyboard, a numeric keypad, or controls that cause certain operations to occur.

Although the touch-sensitive data entry and display screen 20 is the preferred means of data entry, those skilled in the art will understand that data may be entered by other means, including audibly. Furthermore, textual instructions and statements presented to the user on the display screen 20 may be audibly announced using voice wave files and a voice chip often built into the PDA 14.

The processor 16 is also connected to an information storage device 22, which may be RAM (protected by a battery back up), a removable memory card, or other memory capable for use with a PDA. An input/output (I/O) circuit 24 is connected to the processor 16 and controls communications between the PDA 14 and other devices through a data transfer device 26. Preferably, the data transfer device 26 is an infra-red port. The infra-red port 26 is a known device for communication between devices that are remote to one another and will not be further described herein.

In the preferred embodiment, a stylus (not shown) is used in cooperation with the display screen 20 for data entry. This is done by engaging a tip of the stylus against the display screen 20 and touching controls defined by the screen or writing on the screen.

The stylus can be a wand-mounted symbol reader. The wand-mounted symbol reader is preferably a model Scanteam 6180 by Welch Allyn. The wand-mounted symbol reader includes a light source and detector for reading bar codes as a tip of the wand is swept across a bar code. The tip is made of hard, transparent glass or plastic to withstand repeated drawing across surfaces on which bar codes have been printed. The wand-mounted symbol reader also includes a detector in the wand for detecting light reflected from a bar code and circuitry for decoding the detector output. A resulting signal containing the contents of the bar code is transmitted to the I/O circuit 24 via a cable plugged into a communications port of the PDA 14. The wand scanner may require a battery pack (not shown) for operating power. Wand-mounted symbol readers are well known devices and will not be further described herein.

In the preferred embodiment, the system 12 includes a remote personal computer 30 and a central computer system 40. The remote personal computer 30 is equipped with an infra-red port 32 compatible with the infra-red port 26 of the PDA 14. With appropriate programming of the PDA 14 and the remote personal computer 30, scheduling information can be downloaded from the remote personal computer 30 into the information storage device 22 of the PDA 14 via the infra-red frequency link. Additionally, information acquired by the PDA 14 can be uploaded into the remote personal computer 30. As alternatives to the infra-red link, data communication between the PDA 14 and the remote personal computer 30 may be over other known means, such as cable, radio frequency, or optical links.

The central computer system 40 generates scheduling information and includes a vehicle database 44, a timecard database 46, and a parts inventory database 48. The vehicle database 44 stores vehicle histories that allow analysis of vehicle performance and that provide mechanics with insightful information concerning the vehicles on which they are scheduled to perform maintenance. The timecard database 46 stores time spent by mechanics in performing various maintenance activities. The timecard database 46 allows the efficiency of the organization's mechanics to be tracked and labor standard times to be accurately set. The parts inventory database 48 stores an inventory of the parts stored at the regional offices.

The parts inventory database 48 allows for the centralized reordering of parts. Furthermore, if a regional office does not have a needed part in its inventory, a mechanic can determine if the part is available from another regional office.

The central computer system 40 is preferably connected to the remote personal computer 30 via normal or cellular telephone lines using a modem 34 of the remote personal computer 30 and a modem 42 of the central computer system 40. In this way, the remote personal computer 30 can access vehicle, timecard and inventory information stored in the central computer system 40 and can receive scheduling information from the central computer system 40.

Although the central computer system 40 does not communicate directly with the PDA 14 in the preferred embodiment, it will be understood that a modem may be included for the PDA 14 for direct communication with the central computer system 40.

An overview of the information transmitted between the components of the system 12 for coordinating maintenance activities for a fleet of motor vehicles is best shown by Fig. 2. A weekly maintenance schedule for each mechanic of the organization is generated in the central computer system 40 and downloaded to remote personal computers 30 at the regional offices of the mechanics.

Downloaded with the weekly maintenance schedules are corporate tables that have been modified since the last downloading operation. As used herein, corporate tables are lists of codes associated with maintenance operations. In the preferred embodiment, the corporate tables include job description codes, operation codes, work accomplished codes, job priority codes, part failure codes, repair codes, and the like. Such codes provide a consistent format for mechanics to record information concerning maintenance activities, which allows the recorded information to be readily added to the databases.

The maintenance schedules and updated corporate tables are received by the remote personal computers 30 at the regional offices and downloaded to the PDAs 14 of the mechanics. To perform scheduled maintenance, a mechanic logs onto his or her PDA 14 and enters a selection from a menu of scheduled maintenance activities. As the mechanic performs

the maintenance activities of the selection, he or she enters the maintenance activities performed and the parts used into the PDA 14. Simultaneously, the PDA 14 tracks the time being spent for the selected activity.

Upon completion of the selected activity, the mechanic enters a status of the selected activity and a record of activity is stored for the selected activity in the PDA 14. As used herein, the phrase "completion of the selected activity" means that the mechanic has completed working on the selected activity for the present time, not that the selected activity is finished. In the preferred embodiment, the record of activity includes the time spent, the maintenance activities performed and the parts used therein.

At the end of a shift, the records of activity are uploaded from each mechanic's PDA 14 to the remote personal computer 30 of his or her regional office. The records of activity are then transmitted from the remote personal computer 30 to the central computer system 40, in which the vehicle database 44, the timecard database 46, and the parts inventory database 48 are updated.

Fig. 3 is a logical flow diagram showing the process for configuring the PDA 14 and for transmitting recorded information with the PDA 14. Screen displays of the user process are shown by Figs. 4A-4J.

When the PDA 14 is activated, the process displays a main menu screen at state 50 from which a mechanic, or his or her supervisor, can select the time card, the transmit, or the utilities function. The main menu screen is best shown by the screen display of Fig. 4A.

Selections are made from the main menu screen, and from other screens, by touching the portion of the display screen 20 that defines a control of the desired function. In the preferred embodiment, a stylus is used to touch the display screen 20 when making a selection.

The utilities function allows a supervisor to configure the PDA 14. To prevent unauthorized tampering, a supervisor password is required to proceed from the main menu screen to the utilities menu. Accordingly, if the utilities function is selected, the utility branch of state 50 leads to decisional step 52 for validation of the password. The screen for entering the password is best shown by the screen display of Fig. 4B.

If the password is not valid, the NO branch of decisional step 52 returns to state 50 wherein the main menu screen is displayed. If the

password is valid, the YES branch of decisional step 52 leads to state 54. At state 54, the process displays a utilities menu from which the supervisor can select a unit identification, a time/date, or an upload utilities function. The utilities menu screen is best shown by the screen display of Fig. 4C.

If the unit identification function is selected from the utilities menu, the unit identification branch of state 54 leads to step 56 wherein a region, or district, of the PDA 14 is received. The screen for entering unit identification information is best shown by the screen display of Fig. 4D.

As shown by Fig. 4D, the supervisor enters unit identification information with the stylus via an alphabet keyboard displayed at the bottom of the display screen 20. Next, at step 58, an identification number of the PDA 14 is received. At step 60, the name of the mechanic to whom the PDA 14 is assigned is received. The unit identification information, like other information received by the PDA 14, is stored in the information storage device 22. Step 60 returns to state 54 wherein the utilities menu is displayed.

If the time/date function is selected from the utilities menu, the time/date branch of state 54 leads to step 62 wherein the current date is received. The screen for entering time/date information is best shown by the screen display of Fig. 4E.

As shown by Fig. 4E, the supervisor enters time/date information with the stylus via a numeric keypad displayed at the bottom of the display screen 20. Next, at step 64, the current time is received. Step 64 returns to state 54, wherein the utilities menu is displayed.

The upload utilities function allows a supervisor to upload a timecard file from a five-day archive of timecard files in the information storage device 22. The archived timecard files are uploaded from the PDA 14 to the remote personal computer 30. If the upload utilities function is selected from the utilities menu, the upload utilities branch of state 54 leads to step 66 wherein a file selection is received. The screen for selecting a timecard file is best shown by the screen display of Fig. 4F.

As shown by Fig. 4F, the supervisor selects a file by touching the file name, which is then highlighted, on the display screen 20 with the stylus. Next, at step 68, the selected file is uploaded to the remote

personal computer 30 in response to actuation of an upload control on the display screen 20. Step 68 returns to state 54 wherein the utilities menu is displayed.

Returning to Fig. 4C, the utilities menu includes an exit function for leaving the utilities function. If the exit function is selected, the exit branch of state 54 returns to state 50 wherein the main menu screen is displayed.

The transmit function of the main menu screen is used by the mechanic to transmit and receive information. When the transmit function is selected, the transmit branch of state 50 leads to state 70. At state 70, the process displays a transmit menu from which the mechanic can upload daily timecard information or download maintenance schedules, corporate tables, and the like. The transmit menu screen is best shown by the screen display of Fig. 4G.

If the upload timecard function is selected from the transmit menu, the upload branch of state 70 leads to state 72. At state 72, the PDA 14 is set to transmit the mechanic's daily timecard information to the remote personal computer 30 via the infra-red link. The daily timecard information is transmitted in response to a command from the remote personal computer 30 when it is ready to receive the information. Upon completion of the transmission, state 72 returns to state 70 wherein the transmit menu screen is displayed.

If the download function is selected from the transmit menu, the download branch of state 70 leads to state 74. At state 74, the PDA 14 is set to receive files from the remote personal computer 30 via the infra-red link. Such files include weekly maintenance schedules and corporate tables with updated activity and part codes. The files are downloaded in response to a command from the remote personal computer 30 when it is ready to transmit the information. Upon completion of the transmission, state 74 returns to state 70 wherein the transmit menu screen is displayed.

The transmit menu includes an exit function for leaving the transmit function. If the exit function is selected, the exit branch of state 70 returns to state 50 wherein the main menu screen is displayed.

The timecard function of the main menu screen is used by the mechanic to display his or her schedule of maintenance activities and to record maintenance information for those activities. Accordingly, the mechanic typically selects the timecard function after activating the PDA 14 at the beginning of his or her shift.

When the timecard function is selected, the timecard branch of state 50 leads to step 82 wherein the mechanic logs into the PDA 14. In the preferred embodiment, the mechanic logs into the PDA 14 by entering his or her social security number. The log in screen is best shown by the screen display of Fig. 4H. Step 82 proceeds to state 84 wherein a work schedule menu is displayed. The work schedule menu screen is best shown by the screen display of Fig. 4I.

From the work schedule menu, the mechanic selects scheduled maintenance or unscheduled work and records maintenance information as described below in detail. At the end of the mechanic's shift, he or she logs of by selecting End of Day from the work schedule menu. The log off screen is best shown by the screen display of Fig. 4J. When End of Day is selected, the log off branch of state 84 returns to state 50 wherein the main menu is displayed.

Fig. 5 is a logical flow diagram showing the process for performing scheduled maintenance. Screen displays of the user process are shown by Figs. 6A-6J. In the preferred embodiment, scheduled maintenance is divided into inspection activities and repair activities. Inspection activities are those activities in which no repairs are known to be necessary, but which may discover a need for repairs.

If maintenance inspection is selected from the work schedule menu at state 84, the inspection branch leads to state 86. At state 86, a list of scheduled inspections is displayed as a menu of choices for selection. As best shown by Fig. 6A, the scheduled inspection screen comprises a lower portion in which the scheduled inspections are displayed for selection and an upper portion in which a selected activity is displayed. The display of the selected activity includes a brief description of the activity, the planned hours for the activity, and the status of the activity.

In response to a selection by the mechanic, by touching the "NEXT" button on the screen, an internal timer is started at step 88 to

constantly record the time spent performing the maintenance. While performing the selected maintenance, the mechanic enters the parts used and the repairs performed for the selected maintenance through a series of intuitive screen displays.

At decisional step 90 it is determined if parts are used in performing the selected maintenance by querying the mechanic. The screen for querying the mechanic whether parts are used is best shown by the screen display of Fig. 6B, and is displayed throughout the activity for use either as parts are utilized or after completion of the entire task. If parts are used, the YES branch leads to step 92 wherein a part number is received. The screen for entering part information is best shown by the upper portion of the screen display of Fig. 6C.

As shown by Fig. 6C, the mechanic enters the part number with the stylus via a numeric keypad displayed at the bottom of the display screen 20. Alternately, if the stylus is a wand-mounted symbol reader, the part number can be entered by scanning a bar code of the part. At step 94, a dollar amount of the part is received.

Proceeding to step 96 a part failure code is received to characterize parts being replaced. The part failure code may be entered most conveniently by finding the part description in the scrolling menu provided at the middle portion of the screen shown in Fig. 6C, and selecting that part with the stylus. Step 96 leads to decisional step 98 wherein it is determined whether more parts were used. If more parts were used, the YES branch returns to step 92 wherein another part number is received on a reset screen as in Fig. 6C. If no more parts were used, the NO branch of decisional step 98 leads to decisional step 100. Additionally, if no parts were used at decisional step 90, the NO branch of decisional step 90 leads to decisional step 100.

At decisional step 100 it is determined if repairs were performed for the selected maintenance by querying the mechanic. The screen for querying the mechanic whether repairs were performed is best shown by the screen display of Fig. 6D. If repairs were performed, an operation code and a job description code must be entered. The YES branch leads to step 102 wherein an operation code of the repair is received. The screen for entering the operation code is best shown by the screen display of

Fig. 6E, which includes a scrolling menu of operations. The mechanic enters a code by touching the desired code, which is then highlighted on the display screen 20, with the stylus.

Proceeding to step 104, a job description code of the repair is received. The screen for entering the job description code is best shown by the screen display of Fig. 6F, which displays a scrolling menu of job description codes. At step 106 a work accomplished code of the repair is received. The screen for entering the work accomplished code is best shown by the screen display of Fig. 6G, which displays a menu of such codes. The work is assigned a priority code at step 108. The screen displaying a menu for entering the priority code is best shown by the screen display of Fig. 6H.

Step 108 leads to decisional step 110 wherein it is determined whether more repairs were performed by querying the mechanic. The screen for querying the mechanic whether more repairs were performed is best shown by the screen display of Fig. 6I. If more repairs were performed, the YES branch returns to step 102 and the screen of Fig. 6E is again displayed for receipt of an operation code for another repair. If no more repairs were performed, the NO branch of decisional step 110 leads to decisional step 112. Additionally, if no repairs were performed for the selected maintenance at decisional step 100, the NO branch of decisional step 100 leads to decisional step 112.

At decisional step 112, it is determined if the scheduled maintenance is complete by querying the mechanic. The screen for querying the mechanic whether the scheduled maintenance is complete is best shown by the screen display of Fig. 6J. This screen displays a summary of the maintenance activity performed. If the scheduled maintenance is not complete, the NO branch returns to decisional step 90 and the screen of Fig. 6B such that other information can be entered. If the scheduled maintenance is complete, the YES branch of decisional step 112 leads to step 114 wherein the internal clock is stopped and the time spent performing the scheduled maintenance is determined.

The information recorded for the maintenance activity forms a record of activity for updating the vehicle, the timecard, and the parts inventory databases. Such information is temporarily stored in the PDA 14 in the information storage device 22. The databases in the remote computers

are updated periodically by uploading the record of activity to the personal computer 30, which then uploads the record of activity to the central computer system 40, in a manner described above in connection with the utilities function. Step 114 returns to state 84 wherein the work schedule menu is displayed.

If maintenance repairs is selected from the work schedule menu at state 84, the repair branch leads to state 116. At state 116, a list of scheduled repairs are displayed as a menu of choices for selection.

In response to a selection by the mechanic, an internal timer is started at step 118 to contemporaneously record the time spent performing the maintenance. Step 118 leads to decisional step 90 for entering the parts used and the repair activities performed for the selected maintenance through a series of intuitive screen displays. The entry of information proceeds in the same manner as described above in connection with parts used and repairs conducted as a result of scheduled inspections originating at state 86.

Fig. 7 is a logical flow diagram showing the process for performing unscheduled maintenance. Screen displays of the user process are shown by Figs. 8A-8D. In the preferred embodiment, unscheduled maintenance is divided into unscheduled activities and breakdown activities.

If unscheduled maintenance is selected from the work schedule menu at state 84, the unscheduled branch leads to state 120. At state 120, a list of vehicles is displayed as a menu of choices for selection. The list of vehicles screen is best shown by the screen display of Fig. 8A. The list includes a selection for entering new vehicles. The screen for entering new vehicles is best shown by the screen display of Fig. 8B.

In response to a selection by the mechanic, by touching the "NEXT" button on the screen, an internal timer is started at step 122 to constantly record the time spent performing the selected maintenance. While performing the selected maintenance, the mechanic enters the parts used and the repairs performed for the selected maintenance through a series of intuitive screen displays.

Step 122 leads to step 124 wherein an operation code of the selected maintenance is received. Proceeding to step 126, a job description code of the selected maintenance is received. At step 128, a work

accomplished code of the selected maintenance is received. The mechanic enters the codes of the selected maintenance by touching the desired code in a list, which is then highlighted, on the display screen 20 with the stylus.

The steps following step 128 are similar to steps 90-114 of Fig. 5, and the screens presented to the user are similar to those shown in Fig. 6A-6J. Step 128 leads to decisional step 130 wherein it is determined if parts were used in performing the selected maintenance by querying the mechanic. If parts were used, the YES branch leads to step 132 wherein a part number is received. Proceeding to step 134, the dollar amount of the part is received. At step 136 a part failure code is received.

Step 136 leads to decisional step 138 wherein it is determined whether more parts were used. If more parts were used, the YES branch returns to step 132 wherein another part number is received. If no more parts were used, the NO branch of decisional step 138 leads to decisional step 140. Additionally, if no parts were used at decisional step 130, the NO branch of decisional step 130 leads to decisional step 140.

At decisional step 140 it is determined if other repairs were performed with the selected maintenance by querying the mechanic. If other repairs were performed, the YES branch leads to step 142 wherein an operation code of the repair is received. Proceeding to step 144, a job description code of the repair is received. At step 146 a work accomplished code of the repair is received. A priority code of the repair is received at step 148.

Step 148 leads to decisional step 150 wherein it is determined if more repairs were performed by querying the mechanic. If more repairs were also performed, the YES branch returns to step 142 wherein an operation code of another repair is received. If no more repairs were performed, the NO branch of decisional step 150 leads to decisional step 152. Additionally, if no other repairs were performed with the selected maintenance at decisional step 140, the NO branch of decisional step 140 leads to decisional step 152.

At decisional step 152, it is determined if the scheduled maintenance is complete by querying the mechanic. If the scheduled maintenance is not complete, the NO branch returns to decisional step 130 such that other information can be entered. If the scheduled maintenance is

complete, the YES branch leads to step 154 wherein the internal clock is stopped and the time spent performing the scheduled maintenance is determined. Step 154 returns to state 84 wherein the work schedule menu is displayed.

If breakdown maintenance is selected from the work schedule menu at state 84, the breakdown branch leads to step 158 wherein an internal timer is started to constantly record the time spent performing the breakdown maintenance. Step 158 leads to step 160 wherein a breakdown memo number is received. The screen for entering the breakdown memo number is best shown by the screen display of Fig. 8C. As shown by Fig. 8C, the mechanic enters breakdown information with the stylus via a numeric keypad displayed at the bottom of the display screen 20.

At step 162, the date of the breakdown is received. At step 164, and referring to the screen shown in Fig. 8D, the time the breakdown call was obtained is received. The time the mechanic left to travel to the breakdown site is received at step 166. The time the mechanic arrived at the breakdown site is received at step 168. Step 168 leads to step 124 wherein an operation code of the breakdown repair is received. Breakdown information is stored in the information storage device 22 for later transmission to the remote personal computer 30.

In summary, the present invention provides a method and system for coordinating maintenance activities for a fleet of motor vehicles. The system utilizes an intelligent, hand-held, portable data entry and data processing device to display maintenance schedule for a fleet of vehicles as a menu of choices for selection, to store a record of activity for a selected activity, and to transmit the record of activity for updating a database for the vehicles.

Programmers of ordinary skill in the art will be able to provide software to carry out the specific functions described above. Furthermore, those skilled in the art will understand that the various steps of the present invention may include other error branches that cause the process to abort if an error condition exists in the PDA 14. Such error branches are well known in the art and are not directly related to the present invention. Accordingly, they will not be further described.

From the foregoing description of the preferred embodiments and the several alternatives, other alternative constructions of the present invention may suggest themselves to those skilled in the art. Therefore, the scope of the present invention is to be limited only to the claims below and the equivalents thereof.

Claims

1. A system for coordinating activities, comprising:

an intelligent, hand held, portable device, including:

(a) an input device for receiving information;

(b) a data transfer device for receiving and transmitting information;

(c) an information storage device;

(d) a screen device for displaying information; and

(e) a processor coupled to said input device, said data transfer device, said information storage device, and said screen device, said processor being operative to:

(1) store a schedule of activities to be performed with respect to a plurality of objects of a type subject to repeated need for said activities;

(2) display said schedule of activities with said screen device as a menu of choices for selection;

(3) store a record of activity for a selection; and

(4) transmit said record of activity for updating a database for said objects.

2. The system for coordinating activities as recited in Claim 1, wherein said record of activity includes time spent performing activities of said selection for updating a timecard database.

3. The system for coordinating activities as recited in Claim 1, wherein a portion of said selections use inventory items and wherein said record of activity includes an accounting of said inventory items used in performing activities of said selection for updating a database for said inventory items.

4. The system for coordinating activities as recited in Claim 1, wherein said input device is a touch sensitive device associated with said screen.

5. The system for coordinating activities as recited in Claim 4, further comprising a wand-mounted symbol reader.

6. The system for coordinating activities as recited in Claim 1, wherein said data transfer device is a radio frequency data transfer device.

7. The system for coordinating activities as recited in Claim 1, wherein said objects are vehicles and said activities for said objects are vehicle maintenance activities.

8. The system for coordinating activities as recited in Claim 1, further comprising a remote computer including a schedule of said activities and an object database for a plurality of said objects; and wherein said data transfer device of said portable device receives information from said remote computer and transmits information to said remote computer; and wherein said processor of said portable device is operative to receive, store, and display said schedule of activities, and transmit said record of activities to said remote computer for updating said object database.

9. The system for coordinating activities as recited in Claim 1, further comprising a central computer connected for data transfer to said remote computer, said central computer operative to transmit said schedule of activities to said remote computer, and to receive said record of activity from said remote computer.

10. A method for coordinating activities, comprising:

(a) receiving a schedule of activities to be performed with respect to a plurality of objects of a type subject to repeated need for said activities;

(b) displaying on a screen of an intelligent, hand held, portable device said schedule of activities as a menu of choices for selection;

(c) recording activity for a selection; and

(d) updating a database for said objects.

11. The method for coordinating activities as recited in Claim 10, wherein said record of activity includes time spent performing activities of said selection, further comprising the step of updating a timecard database.

12. The method for coordinating activities as recited in Claim 10, wherein a portion of said selections use inventory items and wherein said record of activity includes an accounting of said inventory items used in performing activities of said selection, further comprising the step of updating an inventory database for said inventory items.

13. The method for coordinating activities as recited in Claim 10, wherein said objects are a plurality of motor vehicles and said activities are vehicle maintenance activities.

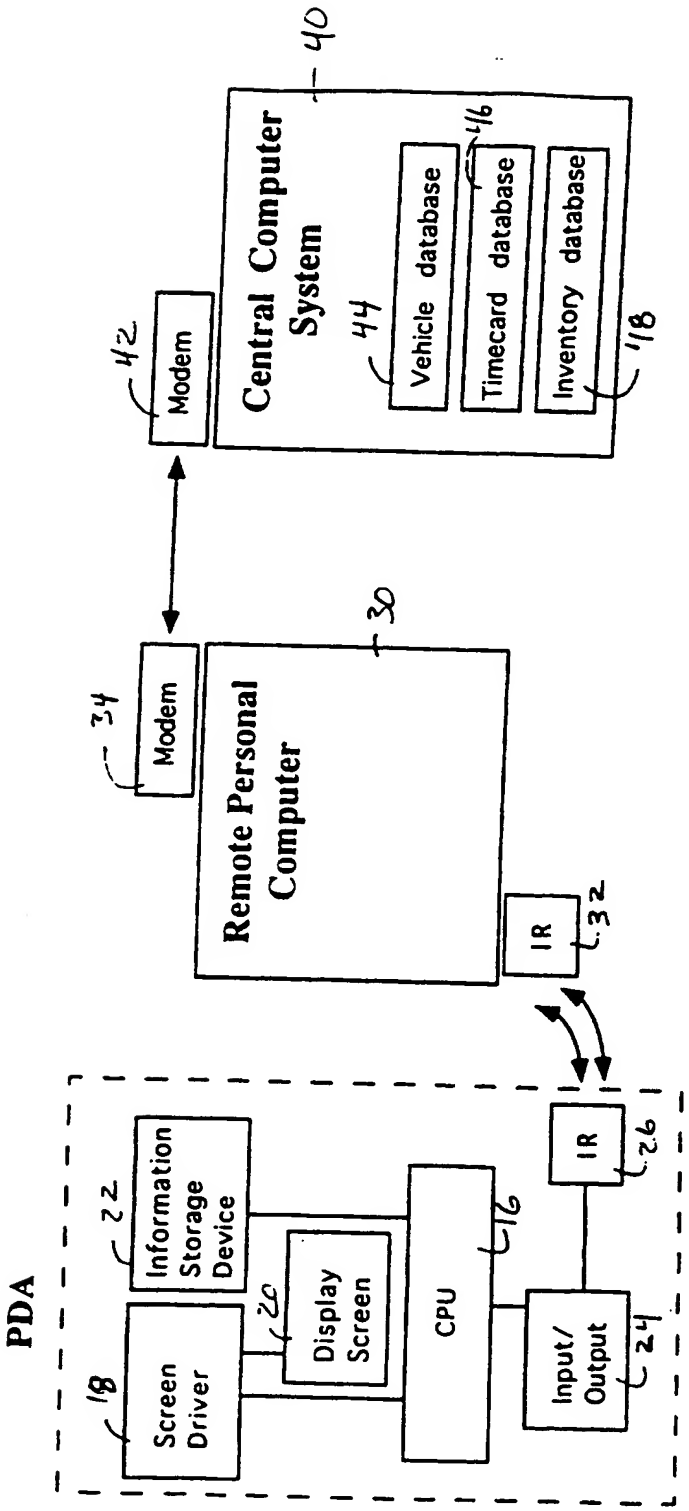

40
Central Computer System
46
Vehicle database
Timecard database
Inventory database
44
118
42
Modem
30
34
Modem
Remote Personal Computer
IR
32
PDA
22
Information Storage Device
20
Display Screen
CPU
16
IR
26
18
Screen Driver
Input/ Output
24

Figure 1

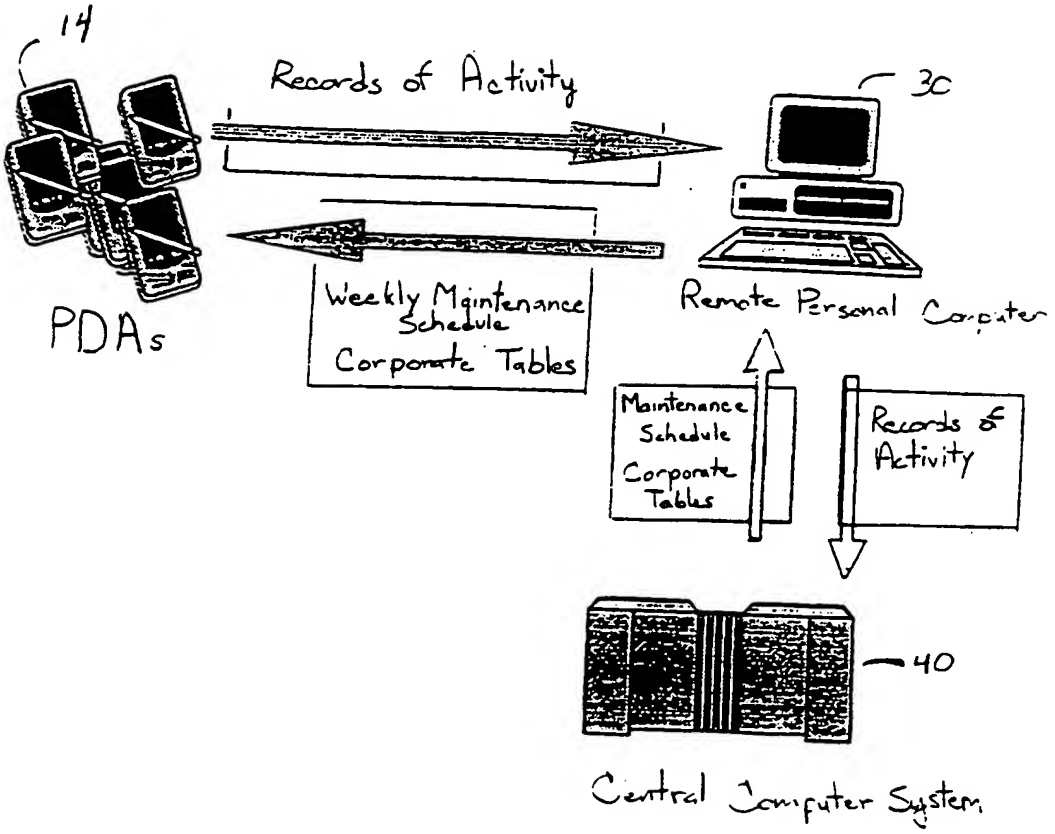
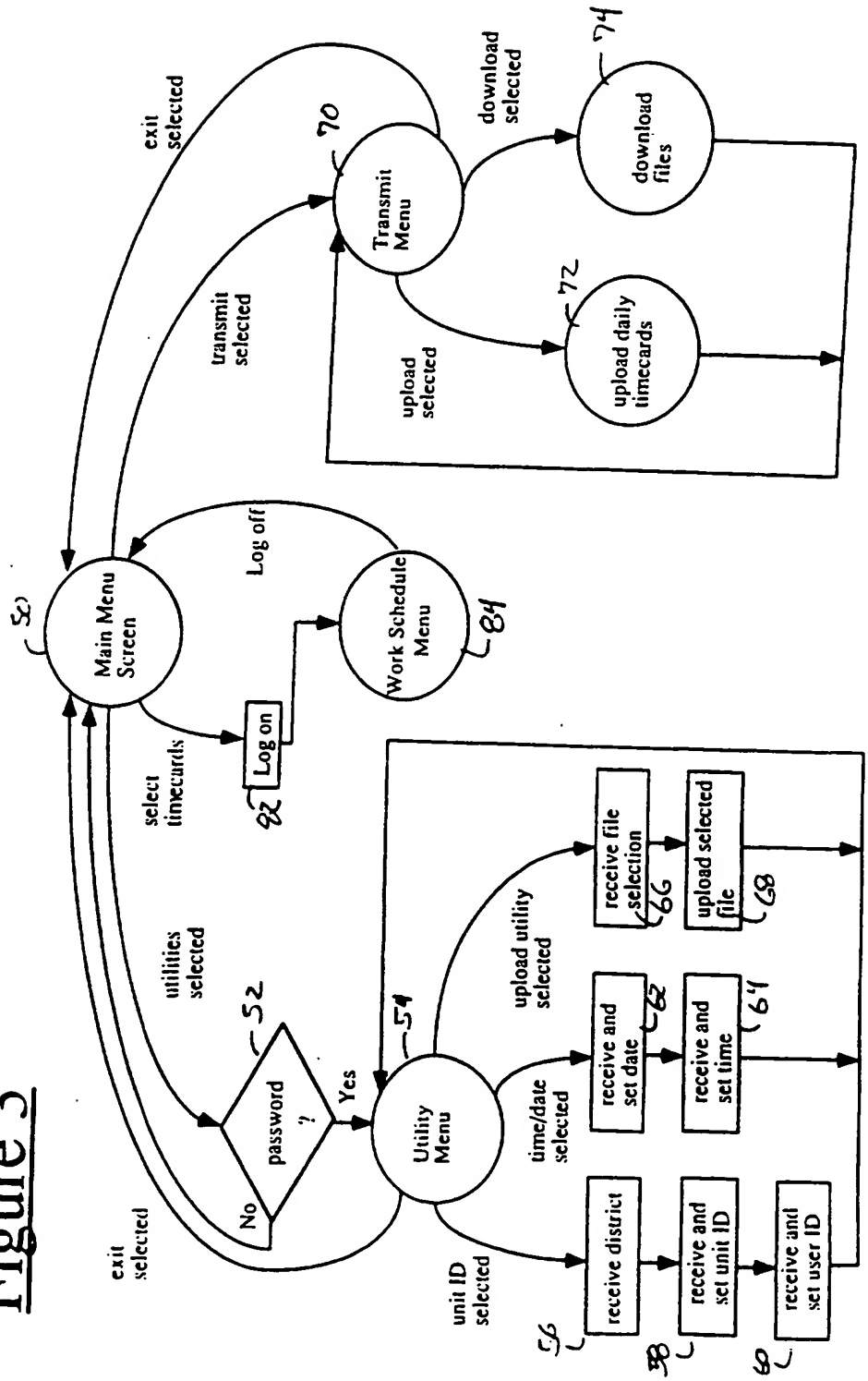

14
Records of Activity
30
PDAs
Weekly Maintenance Schedule
Corporate Tables
Remote Personal Computer
Maintenance Schedule
Corporate Tables
Records of Activity
40
Central Computer System

FIGURE 2

Figure 3


Main Menu Screen
50
Log on
82
Work Schedule Menu
84
Log off
select timecards
utilities selected
password ?
52
No
Yes
exit selected
Utility Menu
54
time/date selected
receive and set date
62
receive and set time
64
upload utility selected
receive file selection
66
upload selected file
68
unit ID selected
receive district
56
receive and set unit ID
58
receive and set user ID
60
exit selected
transmit selected
Transmit Menu
70
upload selected
upload daily timecards
72
download selected
download files
74

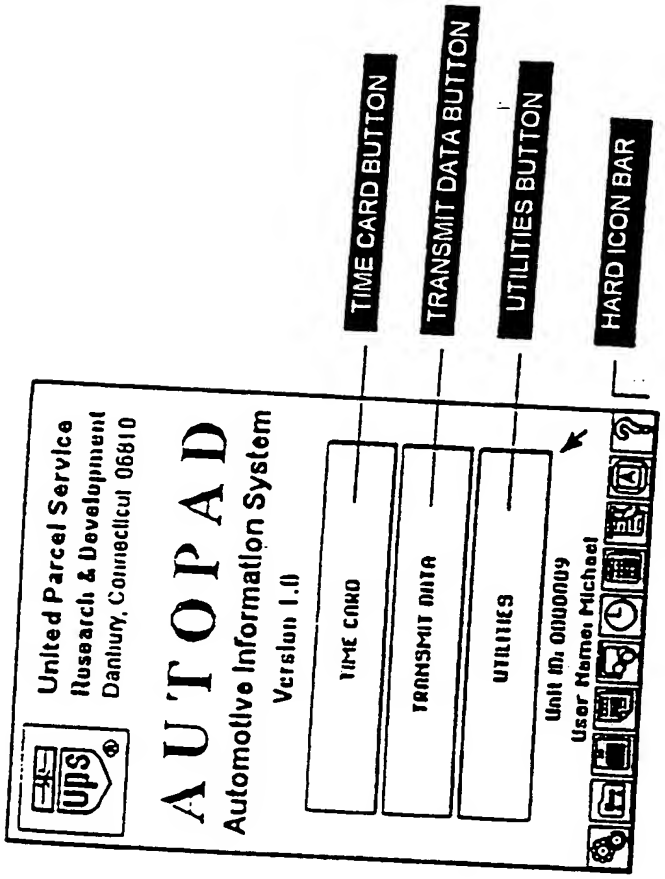

TIME CARD BUTTON
TRANSMIT DATA BUTTON
UTILITIES BUTTON
HARD ICON BAR
United Parcel Service
Research & Development
Danbury, Connecticut 06810
AUTOPAD
Automotive Information System
Version 1.0
TIME CARD
TRANSMIT DATA
UTILITIES
Unit No 0000009
User Name: Michael

Fig. 4A

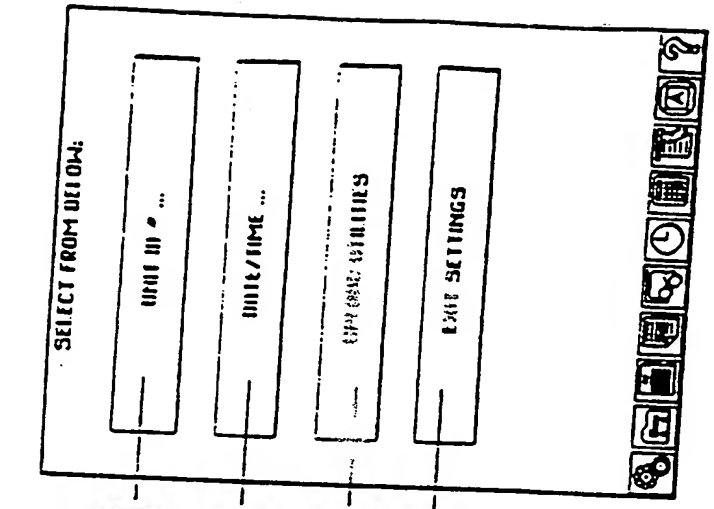


Fig 4C

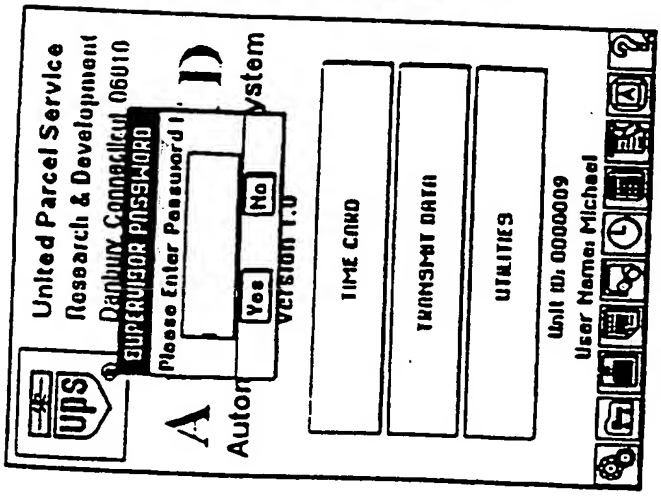


Fig 4B

CHANGE UNIT ID/USER NAME BUTTON

CHANGE DATE/TIME BUTTON

REUPLOAD ARCHIVE FILES MENU BUTTON

REUPLOAD ARCHIVE FILES MENU BUTTON

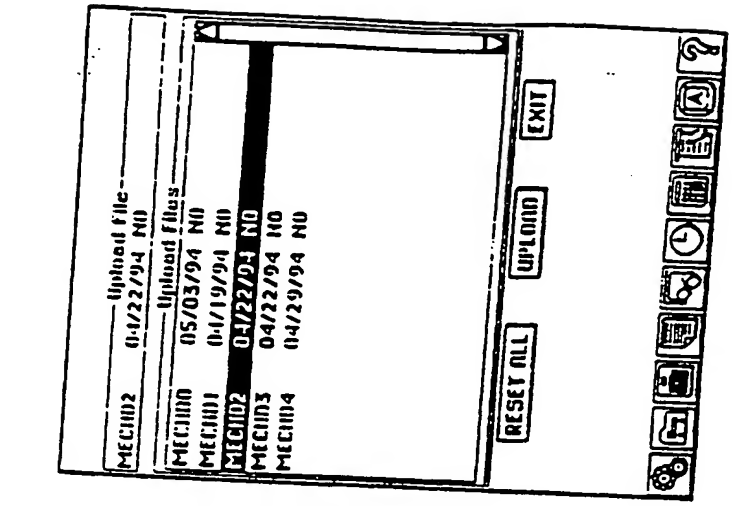


Fig 4F

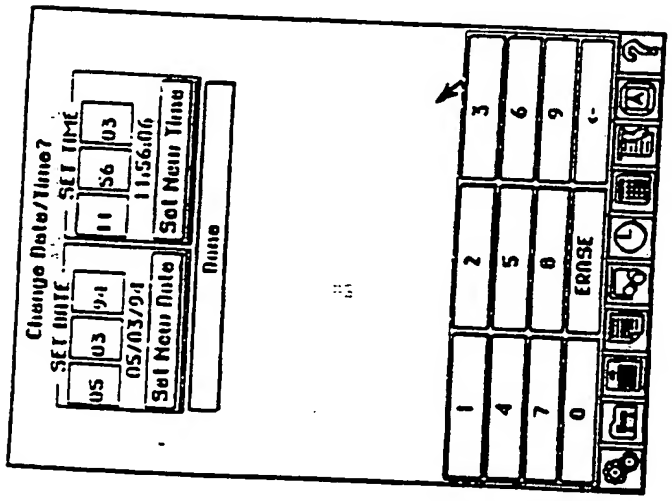


Fig 4E

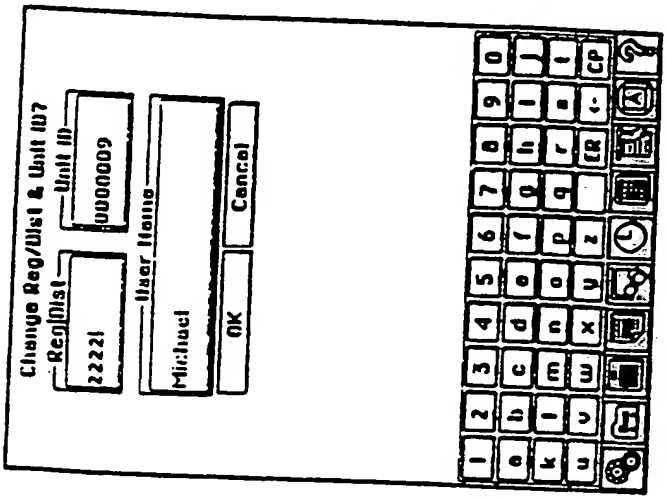


Fig 4D

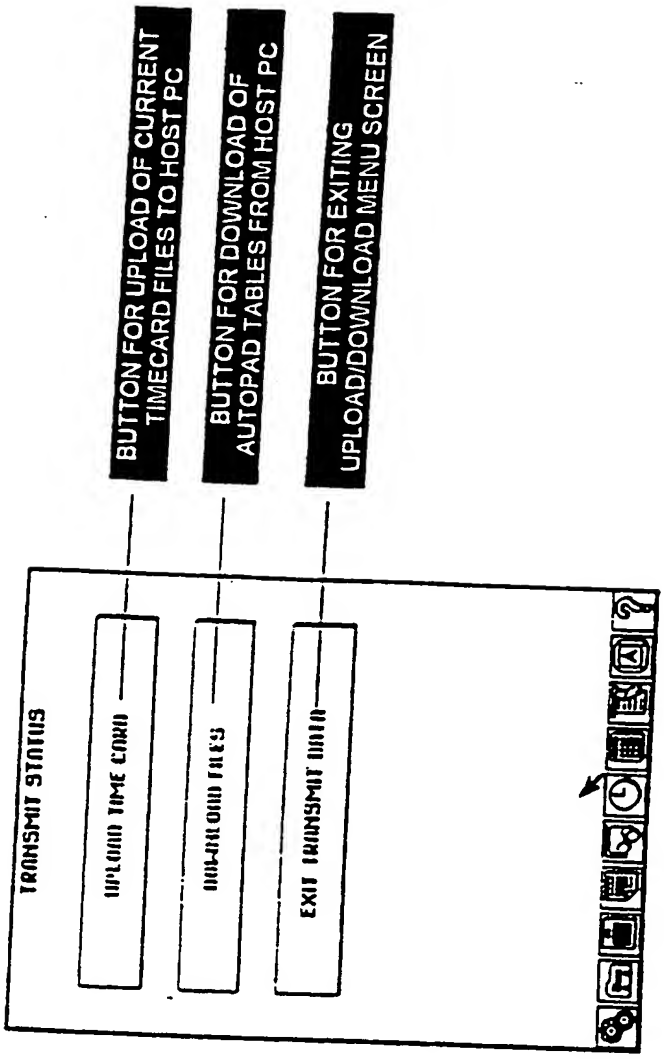

BUTTON FOR UPLOAD OF CURRENT TIMECARD FILES TO HOST PC
BUTTON FOR DOWNLOAD OF AUTOPAD TABLES FROM HOST PC
BUTTON FOR EXITING UPLOAD/DOWNLOAD MENU SCREEN
TRANSMIT STATUS

Fig 4G

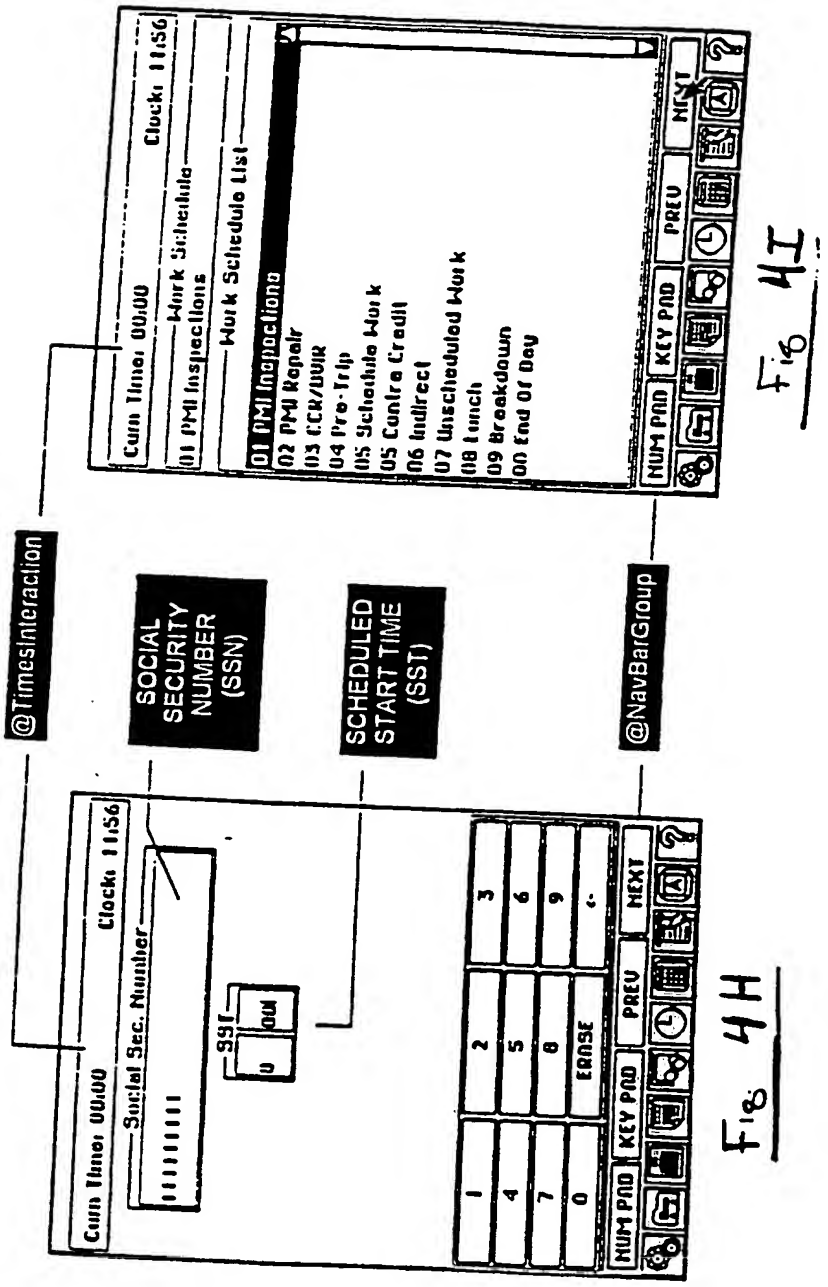

@TimesInteraction
SOCIAL SECURITY NUMBER (SSN)
SCHEDULED START TIME (SST)
@NavBarGroup
Cum Time: 00:00
Clock: 11:56
Work Schedule
01 PM Inspections
Work Schedule List
01 PM Inspections
02 PM Repair
03 ECR/DWR
04 Pre-Trip
05 Schedule Work
05 Contra Credit
06 Indirect
07 Unscheduled Work
08 Lunch
09 Breakdown
00 End Of Day
NUM PAD
KEY PAD
PREV
NEXT
Social Sec. Number
ERASE

Fig 4I

Fig 4H

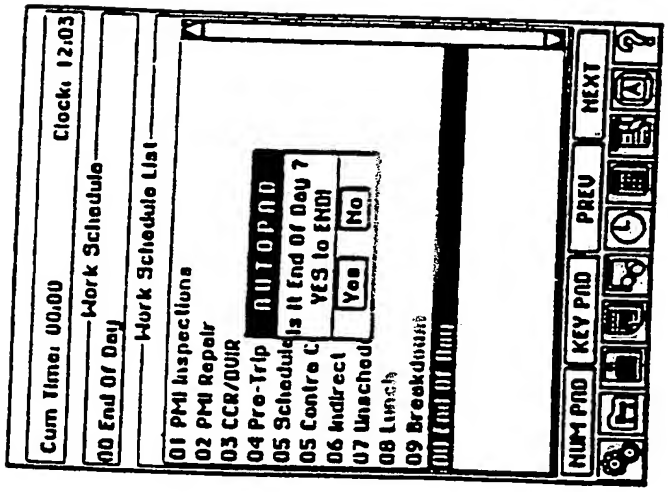

Cum Time: 00:00
Clock: 12:03
Work Schedule
00 End Of Day
Work Schedule List
01 PMI Inspections
02 PMI Repair
03 CCR/OUIR
04 Pre-Trip
05 Schedule
05 Contra C
06 Indirect
07 Unsched
08 Lunch
09 Breakdowns
AUTOPAD
Is It End Of Day ?
YES to END
Yes
No
NUM PAD
KEY PAD
PREV
NEXT

Fig. 43

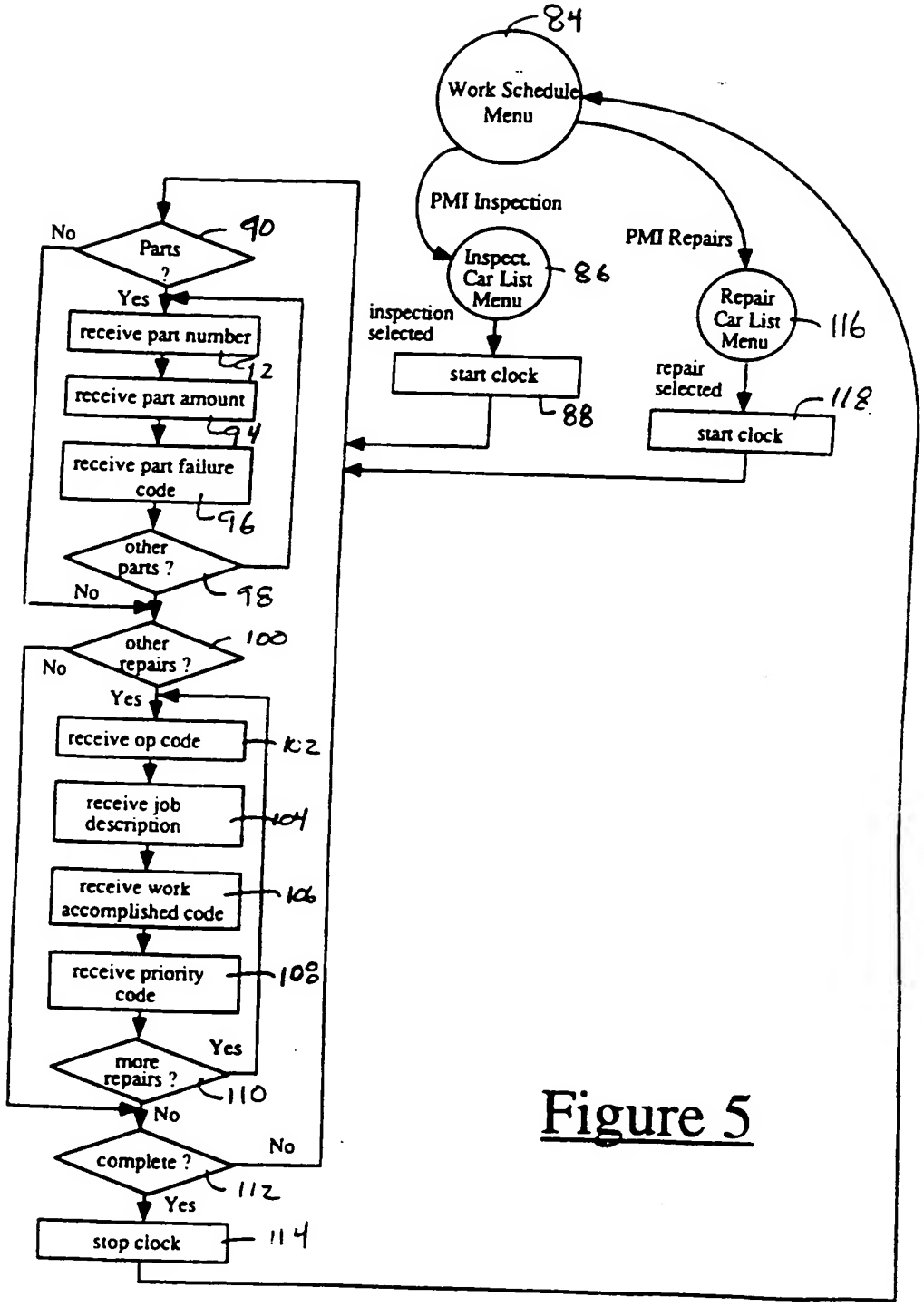

84
Work Schedule Menu
PMI Inspection
PMI Repairs
Inspect. Car List Menu
86
Repair Car List Menu
116
inspection selected
start clock
88
repair selected
118
start clock
No
Parts ?
90
Yes
receive part number
92
receive part amount
94
receive part failure code
96
other parts ?
98
No
other repairs ?
100
No
Yes
receive op code
102
receive job description
104
receive work accomplished code
106
receive priority code
108
more repairs ?
110
Yes
No
complete ?
112
No
Yes
stop clock
114

Figure 5

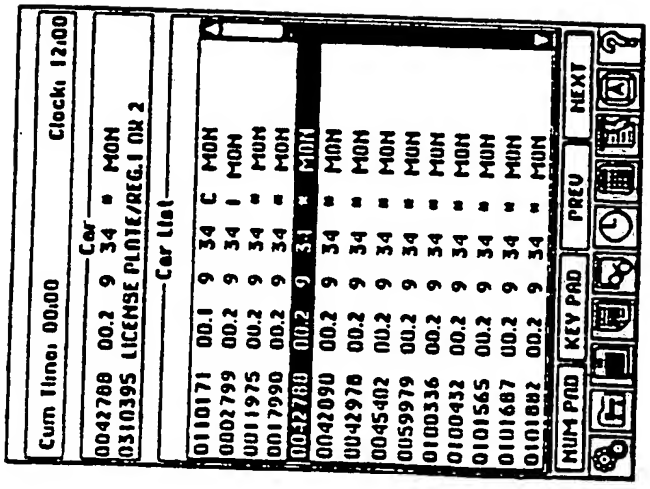


Fig 6A

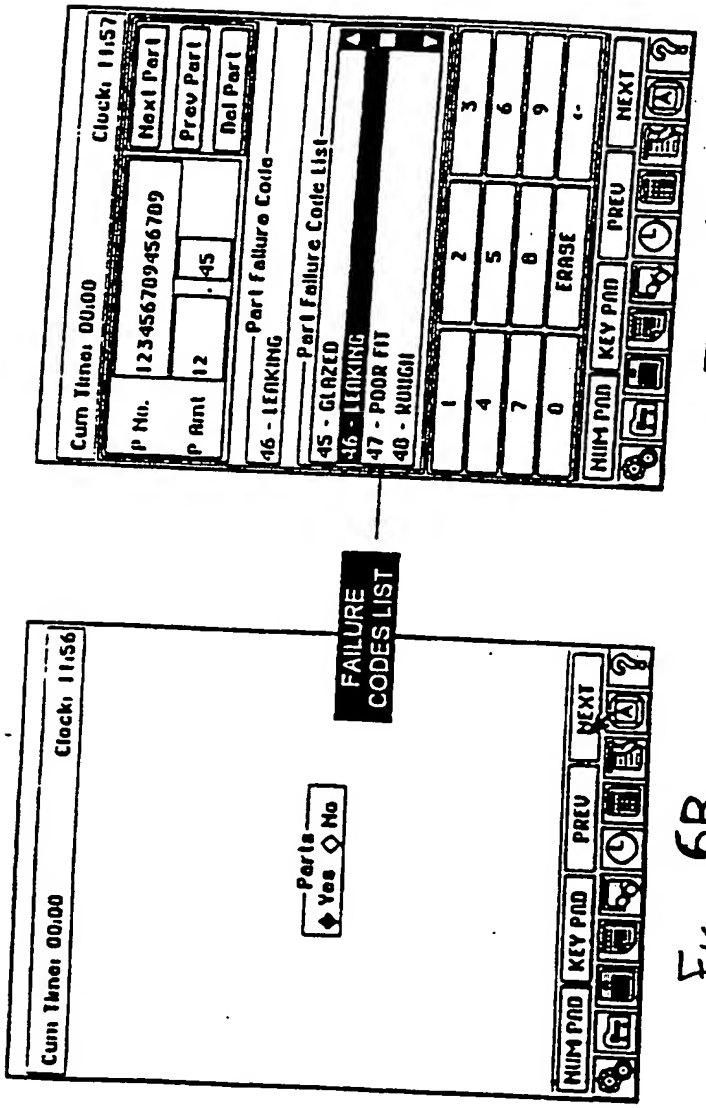

Cum Time: 00:00
Clock: 11:56
Parts
Yes
No
KEY PAD
NUM PAD
PREV
NEXT
FAILURE CODES LIST
Cum Time: 00:00
Clock: 11:57
P No.
P Amt
12345670945670 9
12
45
Next Part
Prev Part
Del Part
Part Failure Code
46 - LEAKING
Part Failure Code List
45 - GLAZED
46 - LEAKING
47 - POOR FIT
48 - ROUGH
1
2
3
4
5
6
7
8
9
0
ERASE
KEY PAD
NUM PAD
PREV
NEXT

Fig 6B

Fig 6C

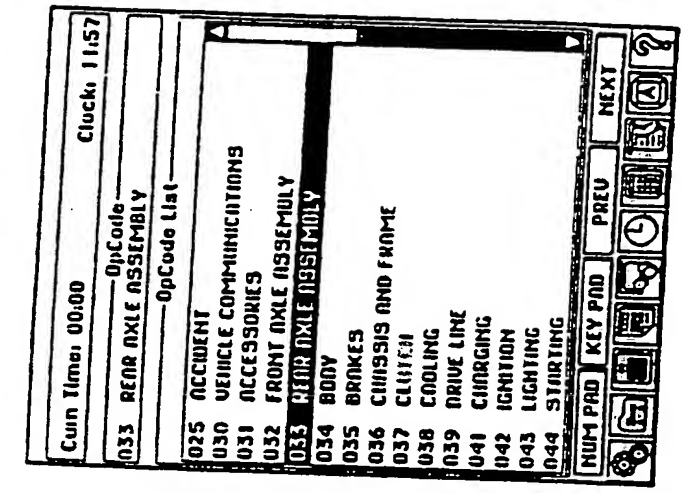

Cum Time: 00:00
Clock: 11:57
OpCode
033 REAR AXLE ASSEMBLY
OpCode List
025 ACCIDENT
030 VEHICLE COMMUNICATIONS
031 ACCESSORIES
032 FRONT AXLE ASSEMBLY
033 REAR AXLE ASSEMBLY
034 BODY
035 BRAKES
036 CHASSIS AND FRAME
037 CLUTCH
038 COOLING
039 DRIVE LINE
041 CHARGING
042 IGNITION
043 LIGHTING
044 STARTING
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6E

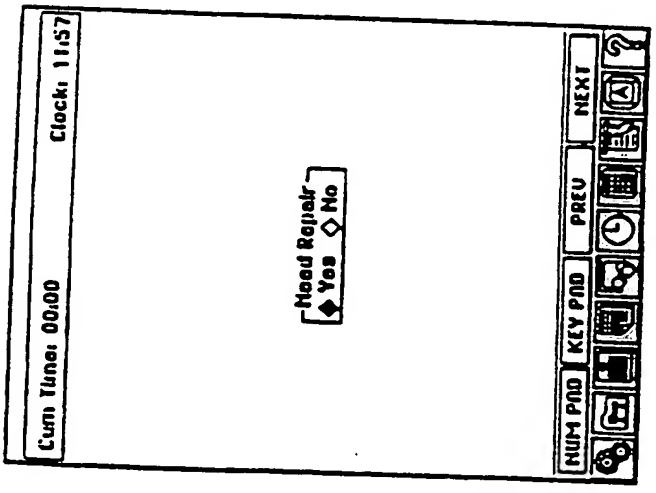

Cum Time: 00:00
Clock: 11:57
Need Repair
Yes
No
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6D

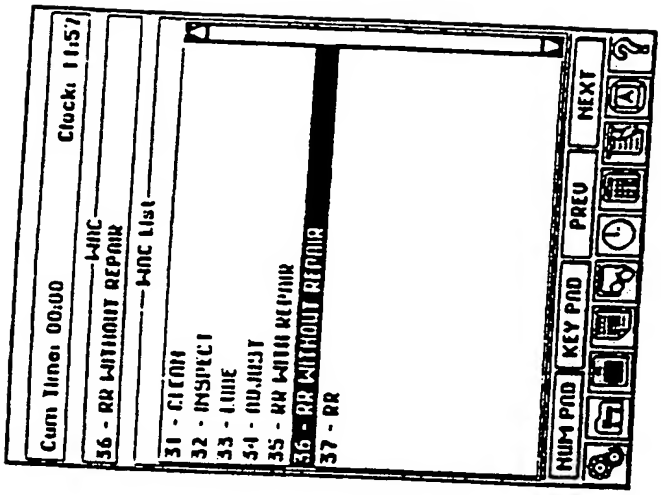

Cum Time: 00.00
Clock: 11:57
WUC
36 - RR WITHOUT REPAIR
WUC List
31 - CLEAN
32 - INSPECT
33 - LUBE
34 - ADJUST
35 - RR WITH REPAIR
36 - RR WITHOUT REPAIR
37 - RR
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6G

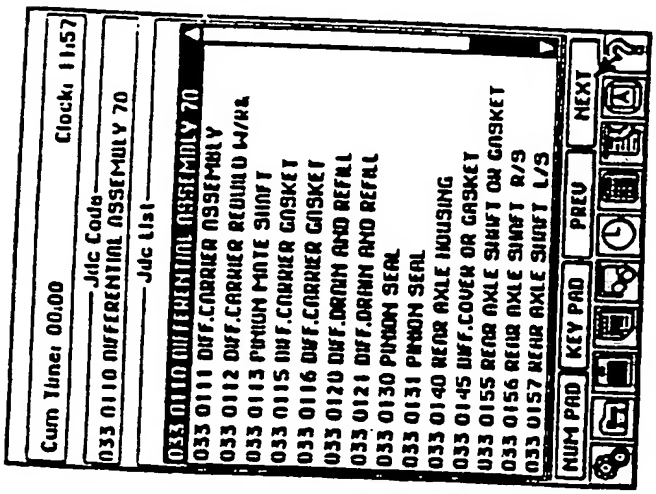

Cum Time: 00.00
Clock: 11:57
Jdc Code
033 0110 DIFFERENTIAL ASSEMBLY 70
Jdc List
033 0110 DIFFERENTIAL ASSEMBLY 70
033 0111 DIFF.CARRIER ASSEMBLY
033 0112 DIFF.CARRIER REBUILD W/RR
033 0113 PINION MATE SHAFT
033 0115 DIFF.CARRIER GASKET
033 0116 DIFF.CARRIER GASKET
033 0120 DIFF.DRAIN AND REFILL
033 0121 DIFF.DRAIN AND REFILL
033 0130 PINION SEAL
033 0131 PINION SEAL
033 0140 REAR AXLE HOUSING
033 0145 DIFF.COVER OR GASKET
033 0155 REAR AXLE SHAFT OR GASKET
033 0156 REAR AXLE SHAFT R/S
033 0157 REAR AXLE SHAFT L/S
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6F

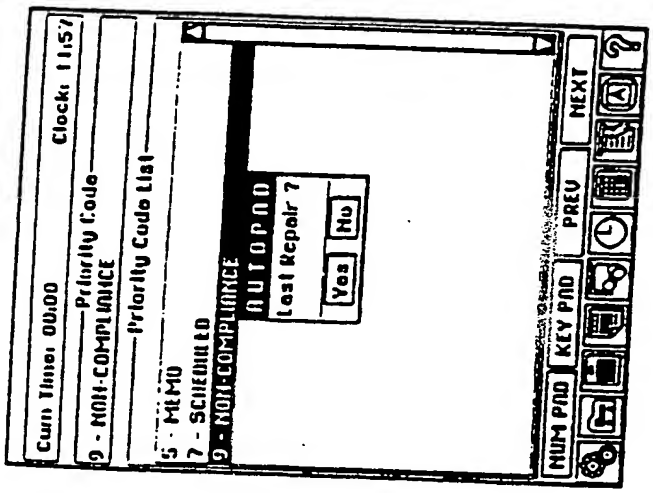

Cum Time: 00:00
Clock: 11:57
Priority Code
9 - NON-COMPLIANCE
Priority Code List
5 - MEMO
7 - SCHEDULED
9 - NON-COMPLIANCE
AUTOPND
Last Repair ?
Yes
No
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6I

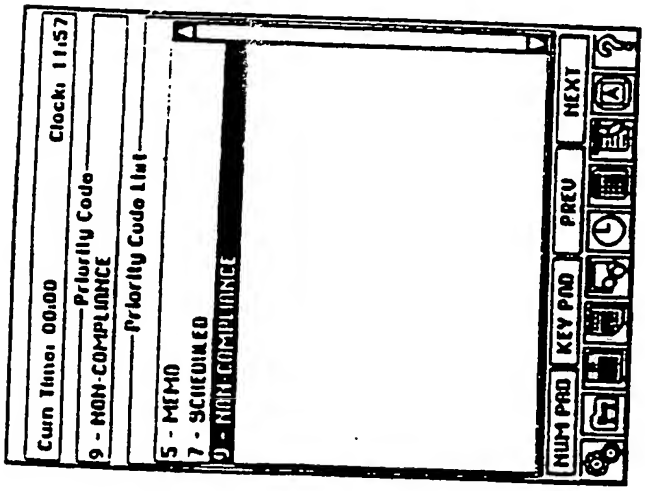

Cum Time: 00:00
Clock: 11:57
Priority Code
9 - NON-COMPLIANCE
Priority Code List
5 - MEMO
7 - SCHEDULED
9 - NON-COMPLIANCE
NUM PAD
KEY PAD
PREV
NEXT

FIG. 6H

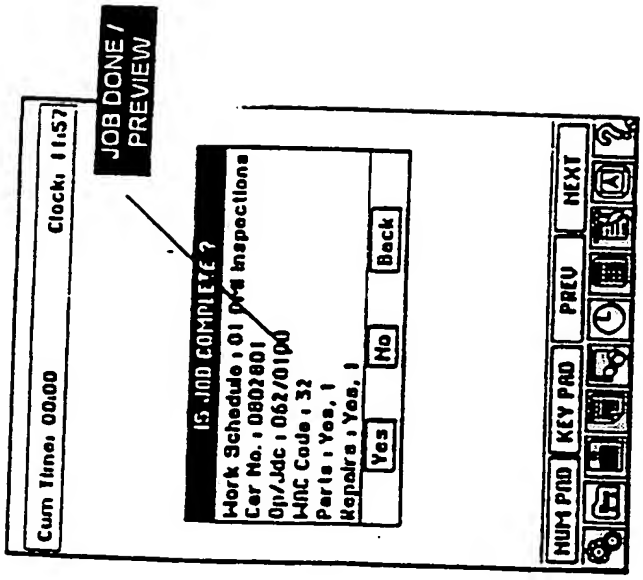

JOB DONE / PREVIEW
Cum Time: 00.00
Clock: 11:57
IS JOB COMPLETE ?
Work Schedule : 01
Car No. : 0802801
Qty/Jdc : 062/0100
Mnt Code : 32
Parts : Yes, 1
Repairs : Yes, 1
Yes
No
Back
NUM PAD
KEY PAD
PREV
NEXT

Fig. 6J

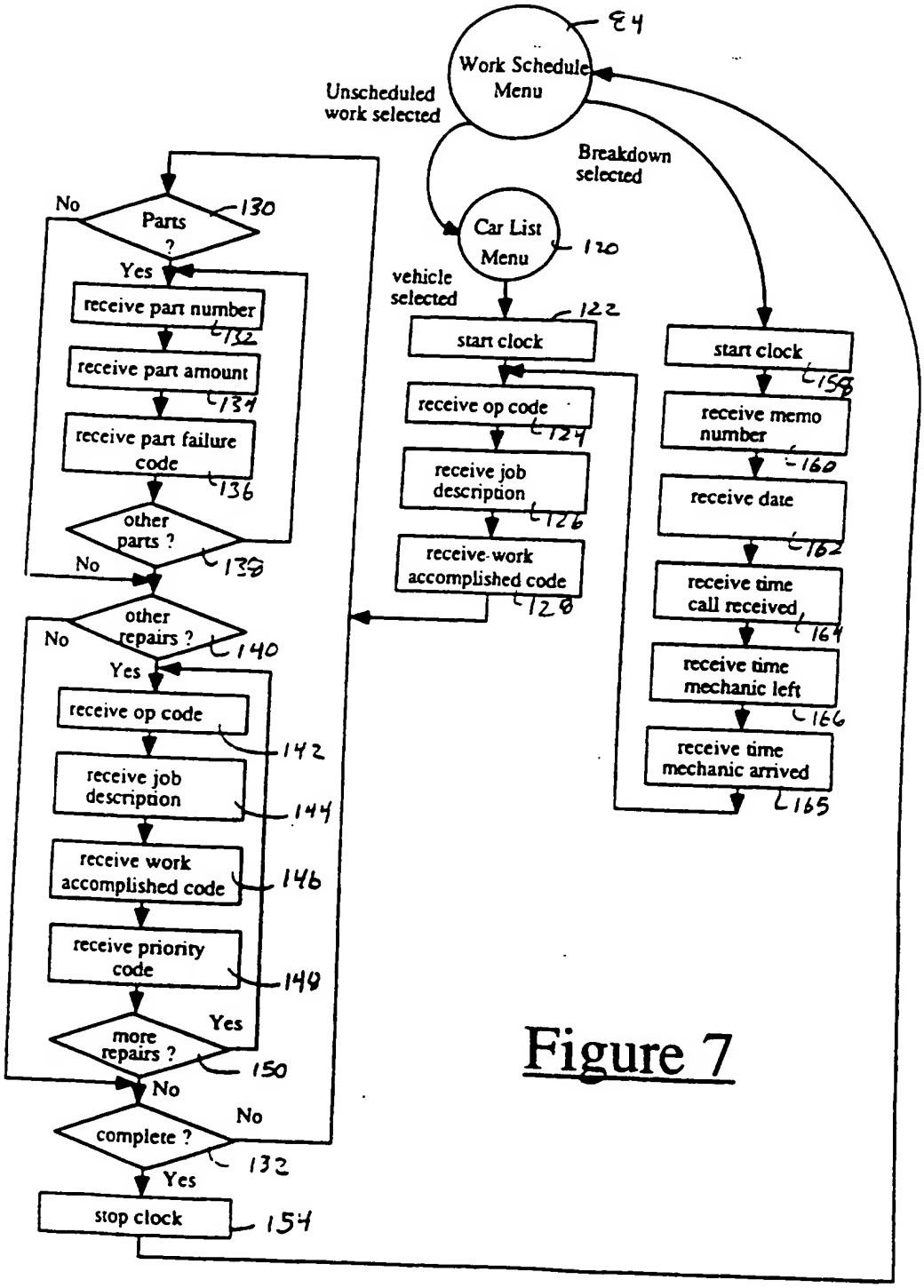

84
Work Schedule Menu
Unscheduled work selected
Breakdown selected
Car List Menu
120
vehicle selected
122
start clock
receive op code
124
receive job description
126
receive work accomplished code
128
start clock
158
receive memo number
160
receive date
162
receive time call received
164
receive time mechanic left
166
receive time mechanic arrived
165
No
Parts ?
130
Yes
receive part number
132
receive part amount
134
receive part failure code
136
other parts ?
138
No
other repairs ?
140
No
Yes
receive op code
142
receive job description
144
receive work accomplished code
146
receive priority code
148
more repairs ?
150
Yes
No
complete ?
132
No
Yes
stop clock
154

Figure 7

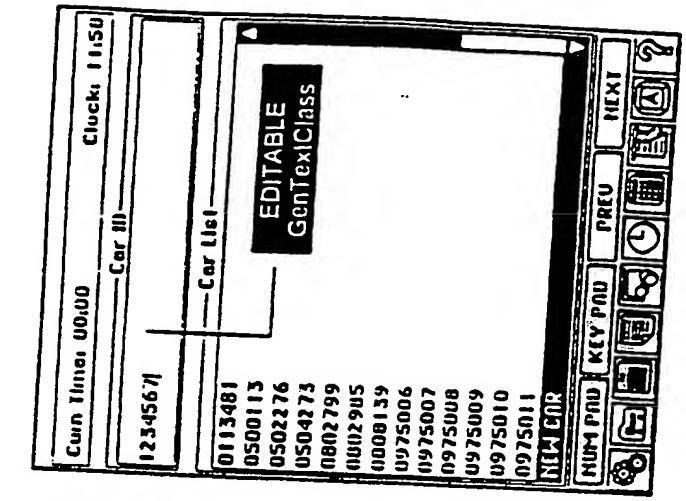

Cum Time: 00:00
Clock: 11:50
Car ID
Car List
1234567
EDITABLE
GenTextClass
0113481
0500113
0502276
0504273
0802799
0802985
0808139
0975006
0975007
0975008
0975009
0975010
0975011
NEW CAR
NUM PAD
KEY PAD
PREV
NEXT

FIG. 8B

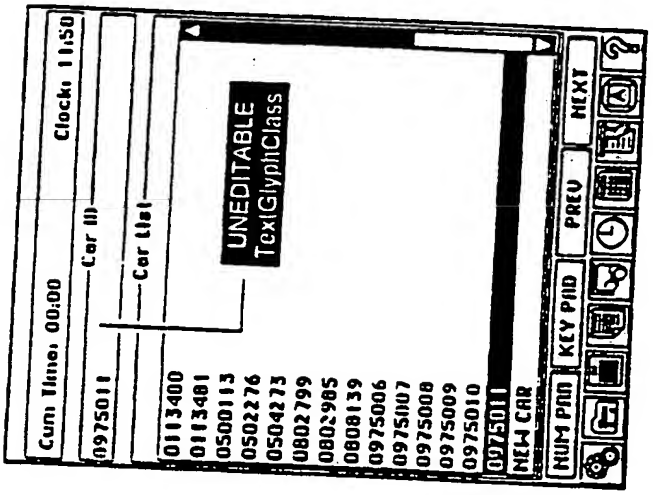

Cum Time: 00:00
Clock: 11:50
Car ID
Car List
0975011
UNEDITABLE
TextGlyphClass
0113400
0113481
0500113
0502276
0504273
0802799
0802985
0808139
0975006
0975007
0975008
0975009
0975010
0975011
NEW CAR
NUM PAD
KEY PAD
PREV
NEXT

FIG. 8A

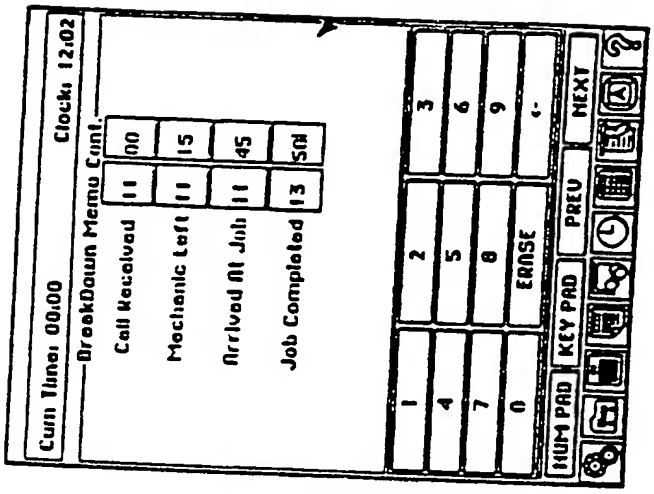

Cum Time: 00:00
Clock: 12:02
BreakDown Memo Cont.
Call Received 11 00
Mechanic Left 11 15
Arrived At Job 11 45
Job Completed 13 SM
1 2 3
4 5 6
7 8 9
0 ERASE ←
NUM PAD
KEY PAD
PREV
NEXT

Fig 8D

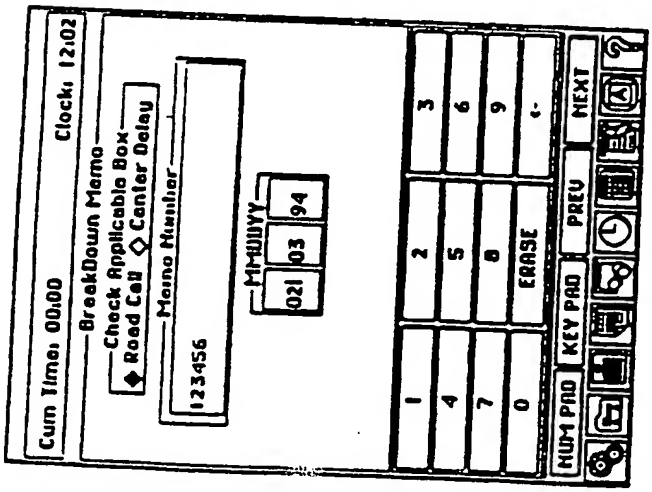

Cum Time: 00:00
Clock: 12:02
BreakDown Memo
Check Applicable Box
Road Call
Center Delay
Memo Number
123456
MM/DD/YY
02 03 94
1 2 3
4 5 6
7 8 9
0 ERASE ←
NUM PAD
KEY PAD
PREV
NEXT

Fig 8C

INTERNATIONAL SEARCH REPORT

Interna ıl Application No
PCT/US 96/02481

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G07C5/00 G07C1/10 G06F15/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G07C G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 628 193 (BLUM ALVIN S) 9 December 1986 see abstract; claims; figures see column 2, line 15 - column 3, line 48 ---	1-3,8, 10-12
X	US,A,4 612 620 (DAVIS DEAN T ET AL) 16 September 1986 see abstract; figures see column 1, line 67 - column 2, line 51 see column 5, line 21 - column 7, line 16 see column 11, line 59 - column 12, line 45 ---	1,8-10
Y	-/--	2,3,5-7, 11-13

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 August 1996	21.08.96
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Meyl, D

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INTERNATIONAL SEARCH REPORT

Internat Application No
PCT/US 96/02481

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 369 188 (TEXAS INSTRUMENTS INC) 23 May 1990 see abstract; claims 10-20; figures see column 9, line 49 - column 11, line 35	1,4,10
Y	US,A,5 068 787 (PIPELLA LAWRENCE S ET AL) 26 November 1991 see abstract; claims; figures	2,11
A	see column 1, line 62 - column 2, line 45	1,10
Y	FR,A,2 559 929 (BELLETANTE GUY) 23 August 1985 see page 2, line 8 - page 6, line 30; figures	3,7,12, 13
A		1,10
Y	FR,A,2 676 846 (INVESTOR ASSOCIES SRL) 27 November 1992 see abstract; claims; figures	5
Y	PATENT ABSTRACTS OF JAPAN vol. 017, no. 242 (P-1535), 14 May 1993 & JP,A,04 365155 (NITSUSAN ARUTEIA KK), 17 December 1992, see abstract	6
A		1,10
A	US,A,5 343 387 (HONMA MASAKI ET AL) 30 August 1994 see abstract; claims; figures	1,2,6, 8-11
A	FR,A,2 689 275 (AUDREN JAMES) 1 October 1993	
A	US,A,4 819 162 (WEBB JR FREDERICK W ET AL) 4 April 1989	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat ·l Application No
PCT/uS 96/02481

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4628193	09-12-86	NONE	
US-A-4612620	16-09-86	NONE	
EP-A-0369188	23-05-90	DE-D- 68925271 JP-A- 2257731 US-A- 5309351	08-02-96 18-10-90 03-05-94
US-A-5068787	26-11-91	NONE	
FR-A-2559929	23-08-85	NONE	
FR-A-2676846	27-11-92	NONE	
US-A-5343387	30-08-94	JP-A- 4191974	10-07-92
FR-A-2689275	01-10-93	NONE	
US-A-4819162	04-04-89	NONE	